4.0 INTERPRETATION AND IMPLEMENTATION OF THE WATER QUALITY OBJECTIVES FOR TEMPERATURE

The interstate temperature objective is written in the form of a prohibition preventing the discharge of elevated temperature waste. Interpretation of the interstate objective is relatively simple, requiring the determination of whether a discharge meets the robust definition of "elevated thermal waste" presented in Section 3.0.

The intrastate temperature objective calls for the maintenance of natural ambient temperature conditions, with certain flexibility afforded at the discretion of the Regional Water Board. The intrastate temperature objective is a narrative objective with associated numeric criteria that allows for its interpretation in the context of specific beneficial uses. Figure 4.1 presents a decision tree representing the logical process of interpreting the intrastate objective. The intrastate objective is interpreted at both the watershed scale and at discrete locations such as a stream reach or pond.

The process shown in Figure 4.1 is most useful in assessments of point sources, impoundments, and discrete sources of elevated water temperature. In other contexts, such as nonpoint source land use permitting, staff typically relies on the implementation of management practices such as riparian buffers and similar conservation practices (see section 4.4, Reliance on Management Practices Associated with Land Uses). Nonpoint source pollution is challenging to control because it is the result of many diffuse and diverse sources occurring across the landscape. Each individual source may contribute only a small portion, but all the sources combined can cumulatively result in water quality problems. A precise quantification of either the condition or the potential impacts associated with any individual parcel is not practicable in implementing temperature protections. Rather, the Nonpoint Source Program focuses on implementing management measures that are known to be effective in controlling nonpoint source pollution, often in the context of other agency's rule making processes or established best management practices. Staff often incorporate such practices as permit terms, as appropriate; Figure 4.1 depicts the process that staff follow in evaluating the efficacy of those practices, and whether additional permits terms are required. However, this process is not typically incorporated into the permit application or enrollment process in these situations.

As seen in Figure 4.1, the first test in interpreting the intrastate objective is whether water temperature is altered from natural conditions. If temperatures have already been altered or could be altered by a proposed project, then a demonstration must be made (to the satisfaction of the Regional Water Board) that (1) the alteration in ambient water temperature has been or would be less than 5 ^{o}F above natural receiving water temperatures and (2) any elevated ambient water temperatures do not adversely affect beneficial uses. The assessment of natural temperature conditions is discussed in Section 4.1, below.

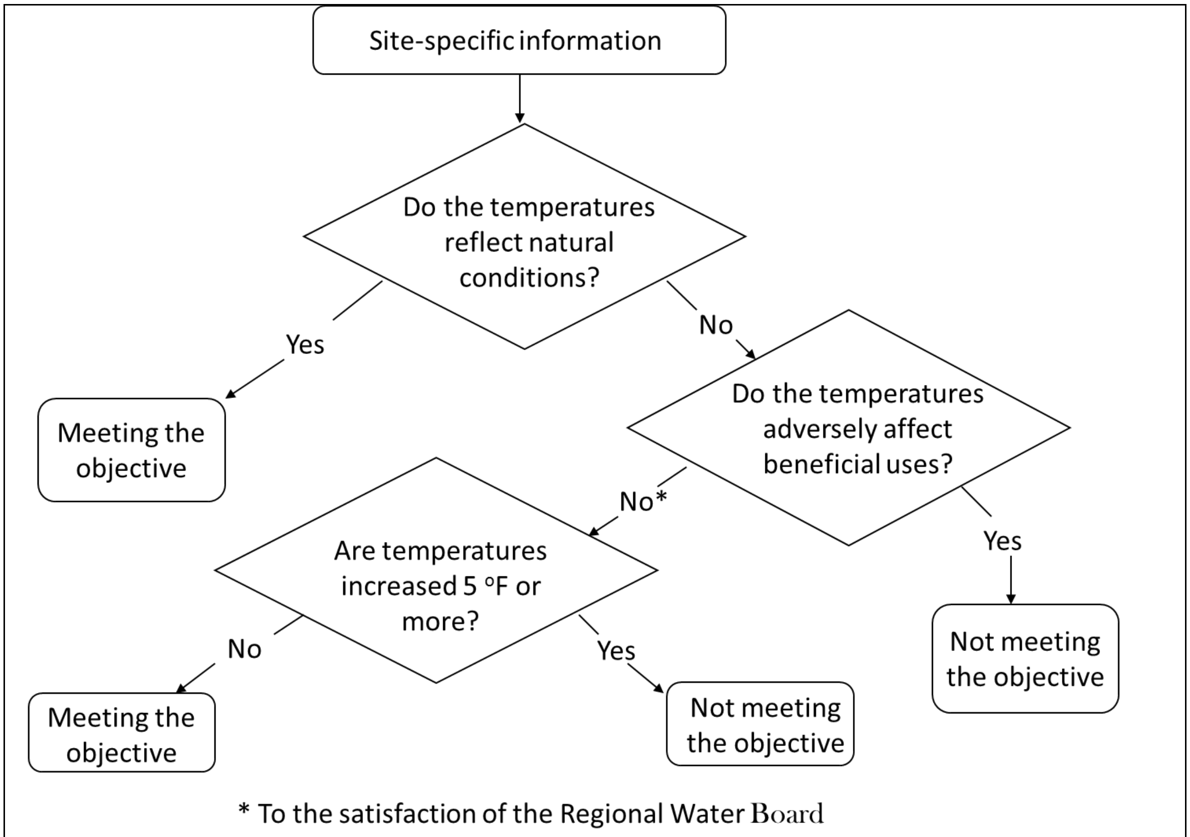

Figure 4.1: Decision tree representing the logical process for determining attainment of the Intrastate Water Quality Objective for Temperature

In the absence of a demonstration that a given temperature alteration won't adversely affect beneficial uses or increase temperatures by 5 °F or more, the objective defaults to no change in temperature. The language of the objective places the burden of proof on the proponent of the action that has potential to alter the temperature. Accordingly, Regional Water Board staff typically establishes permit conditions that are expected to result in no alteration of temperature.

The Regional Water Board may authorize an increase in temperature of up to 5 °F, if appropriate. Given the ongoing and accelerating impacts of global climate change (Cayan et al. 2006), consideration should be given to the expected rise in air temperature over the life of a project when considering increases of temperature of up to 5 °F. For instance, if air temperatures are expected to rise 2 °F over the life of a project, the Regional Water Board should consider limiting any water temperature increases to 3 °F as a precautionary measure. In a study of air temperature records in the Klamath Basin, Bartholow (2005) found that air temperatures have increased 0.5 °C/decade since the 1960s. Other researchers have estimated that water temperatures will rise 0.6-0.8 °C for every 1.0 °C of air temperature rise (Null et al. 2012, Morrill et al. 2005). Given that human-caused climate change is expected to increase air temperatures for decades to come, and that those impacts are outside of the control of the Regional Water Board, the effects of those impacts should be taken into account when considering controllable water temperature increases.

The determination of adverse effects on beneficial uses is based on the thermal requirements of the most sensitive beneficial use present. In most cases in the North Coast Region, the cold freshwater habitat beneficial use (COLD) is the most sensitive beneficial use. Cold water ecosystems in the North Coast Region support fish, amphibians, macroinvertebrates, and other organisms with specific thermal tolerances. Therefore, interpreting the intrastate temperature objective nearly always involves comparing the temperature conditions being considered relative to the temperature conditions that fully support one or more of these organisms.

In situations in which temperatures exceed the biological temperature requirements for full support of the beneficial uses present, no increase in temperature can occur without adverse effects.

Regional Water Board staff typically addresses both cumulative impacts associated with the implementation of multiple projects across landscapes and discrete impacts associated with individual projects through prohibitions and terms of permits. Permit terms are crafted to ensure individual impacts do not cause or contribute to the cumulative impacts of multiple activities by requiring management practices that simulate natural conditions (see sections 4.1 and 4.4). This approach is preferred because it ensures compliance with objectives, prevents impairment associated with the cumulative impacts of multiple projects, and avoids the need for project proponents and staff to quantify thermal impacts associated with small individual projects and assess the cumulative impacts of one project in the context of other projects.

The development of temperature TMDLs in the North Coast Region requires interpretation of the intrastate objective, and thus the application of the logical process shown in Figure 4.1. The temperature TMDLs have also identified and defined conditions necessary to achieve the objective at a watershed scale, drawing on the results of temperature modeling and peer-reviewed scientific literature.

4.1 Estimation of Natural Stream Temperatures

Natural receiving water temperatures are either estimated using standard techniques as described below, or assumed where the factors controlling stream temperature (e.g., shade, sediment deposition, and flow) represent natural conditions.

Natural receiving water temperatures are the temperatures that occur when the factors controlling water temperature, including shade, flow, and channel morphology, are equivalent to their natural condition. Accordingly, the Regional Water Board issues permits to achieve the environmental conditions controlling stream temperature that are equivalent to the thermal regime associated with natural conditions (e.g., restoration of site potential shade, restoration of natural hydrologic form and function, and control of erosion to natural rates).

The control of shade on the surface of waters of the state is a major focus of the Regional Water Board's efforts to meet the intrastate water quality objective for temperature. All temperature TMDLs developed in the Region assign load allocations for shade, with the allocated amount equivalent to natural conditions, and referred to as site-potential effective shade. Site–potential effective shade refers to the amount of shade that can be provided by vegetation at a site, given the species of vegetation present, and taking into consideration the growing conditions at the site (see section 4.2, below). The temperature TMDLs and load allocations are discussed in detail in section 2.4, above.

The intrastate water quality objective for temperature references natural receiving water temperatures. An accurate interpretation of the intrastate water quality objective for temperature then relies in part on the assessment of natural temperatures. In such an assessment, all anthropogenic factors that may cumulatively act on a stream to alter its temperatures must be considered, including:

- Upstream flow alterations;
- Past canopy removal, either mechanically or as a result of increased sediment loads or other types of disturbance; and,
- Alteration of channel characteristics such as width, depth, and streambed permeability, either from engineered alterations or those associated with geomorphic changes caused by hydromodification or altered sediment loads.

Often the temperature of a waterbody in question has been altered in the past. In this case, the degree of temperature alteration must be evaluated to determine:

- Whether the existing temperatures meet the intrastate water quality objective for temperature;
- What beneficial uses may have been supported prior to alteration of the temperature; and,
- How much temperature increase can occur without exceeding the intrastate water quality objective for temperature.

A variety of common techniques are available for estimation of natural stream temperatures for a given situation. Reasonable estimates of natural temperatures can be developed by comparison with reference streams, simple calculations, or use of computer models, depending on the situation. Though a number of techniques may be applied, the most appropriate technique will depend on the site-specific conditions of the location of interest. Factors that may necessitate a more in-depth analysis are:

- Significant alteration of shade conditions;
- Significant alteration of natural hydrologic conditions;,
- Unique hydrologic features such as springs or cold tributaries;

- Estuarine environments; and,
- Thermal stratification.

<u>Defining the alteration of thermal influences</u>
The first step in estimating natural stream temperatures is to identify the thermal factors (such as those listed above) that have been altered from natural conditions. Once the altered thermal factors have been identified, the effects of those alterations can be assessed using the tools described below.

<u>Comparison with reference streams</u>
Reference streams can be helpful for estimating natural temperatures if the reference stream closely resembles the location of interest in a natural state. Headwater stream reaches and mainstem trunk stream reaches are two types of stream environments that are particularly suited for this type of analysis, if shade and meteorological conditions are comparable.

Headwater streams are suited to these types of comparisons because they are close to the stream source, most often groundwater or melting. Groundwater is fairly constant year round, and generally defines the lower temperature limit for streams in the summer months. The lowest reaches of mainstem trunk streams, such as the mainstem Eel River at Alderpoint, are also suited to these types of comparisons because they typically represent temperatures that are in equilibrium with heat sources and sinks. Maximum stream temperatures of the lower reaches of major rivers are typically very similar in the summer months. Stream reaches in between the headwaters and lower mainstem stream reaches are only suited for comparison with reference streams if the riparian, hydrologic, and meteorologic conditions are comparable from the headwaters to the location of interest, which becomes increasingly unlikely with increasing distance from the headwaters.

<u>Simple Calculations</u>
The use of simple calculations can be useful in estimating natural stream temperatures. The mixing equation, $Q_{ds}*T_{ds} = Q_{us}*T_{us} + Q_{trib}*T_{trib}$ (where the Qs represent flows, Ts represent temperatures, ds denotes downstream, us denotes upstream, and trib denotes tributary temperatures and flows) is a helpful equation for calculating the change in temperature downstream of a confluence of two streams. Similarly, Brown's equation, a simple equation representing the relationship of flow, channel geometry, and solar radiation, gives a reasonable estimate of temperature change due to alteration of solar exposure for short stream reaches, where the conditions in the reach are homogeneous (Brown 1970).

<u>Computer models</u>
Many computer models have been developed with the ability to calculate stream temperatures. Some of these models were developed for other purposes and only calculate temperature in order to calculate other water quality related processes, while others were specifically developed with stream temperature applications in

mind. Either type of model can be used to estimate stream temperatures if all the relevant processes and factors are accounted for in the model. For instance, some models do not take into account riparian shade, while others do.

One of the more commonly used simple stream temperature models is SSTEMP, maintained by the USGS. SSTEMP is considered a simple model because it requires no compiler or complicated input files. The calculation scheme is also simple, relying on daily average input data to estimate daily average stream temperatures for a single reach. Accordingly, SSTEMP is well-suited for simple thermal situations. It can be used to evaluate the effects of changes in channel geometry, vegetation, meteorological conditions, and changes in flow. A limitation of the SSTEMP model is that the averaging period of the data used to run the model must be approximately equal to the travel time of the reach being modeled. Also, the SSTEMP model does not perform well if the reach in question encompasses drastic differences in shade, flow, channel geometry, or meteorological conditions within it.

Deterministic computer models are useful in situations where a reach of stream, or a stream network, requires a more sophisticated analysis. These models are designed to accommodate variable conditions in time and space, which requires that those variables be defined in time and space. The definition of those conditions requires large amounts of data. To use a deterministic model to estimate natural temperatures, the natural condition of each factor that influences stream temperatures must be estimated over for the entire temporal and spatial extent of the analysis.

The Klamath TMDL temperature analysis is an example of the use of deterministic models to estimate natural temperatures. As part of that analysis, natural temperatures were estimated by defining the estimated natural conditions of the Klamath River and calculating the temperatures that would result from those conditions using the RMA model (Tetra Tech 2009). Estimates of natural flows from Upper Klamath Lake and downstream tributaries were used to represent natural hydrologic conditions. Similarly, the natural, un-dammed geometry of the Klamath River was characterized to define the natural channel geometry. Finally, existing mainstem shade and meteorological conditions were assumed to be comparable to natural conditions.

4.2 Site Potential Effective Shade

Temperature TMDLs developed in the North Coast Region have interpreted the intrastate water quality objective for temperature and assigned load allocations for solar radiation loading based on its surrogate, effective shade. This metric was chosen because effective shade is inversely and directly proportional to heat, and it is readily measured in the field or calculated using mathematical models. Effective shade is defined as the percent reduction of potential solar radiation delivered to the water surface. Effective shade is different from percent canopy closure, which defines how much of the sky is blocked by vegetation canopy, in that it focuses on the amount of solar energy blocked by vegetation and topography. The amount of effective shade at a site is dependent on where vegetation is relative to the sun's path, taking into account the differences in solar intensity throughout the day (i.e., effective shade takes into account the fact that solar radiation is greatest at noon and at its minimum at dawn and dusk).

The load allocations assigned in north coast TMDLs are expressed as "site potential effective shade", or its approximation "adjusted potential effective shade". Site potential effective shade is the effective shade that a site has potential to provide, given the conditions present at the site. The site potential shade concept accommodates the fact that the level of potential effective shade varies from site to site based on the type of vegetation growing at a site and other site conditions such as soils, hydrology, topography, geology, and geomorphology that determine the growth and vigor of vegetation. Site potential shade also implicitly recognizes that topography and emergent vegetation can also provide effective shade, in addition to riparian vegetation.

<u>4.3 Site-specific Implementation</u>

Interpretation of the intrastate water quality objective for temperature at the project scale requires consideration of the particular conditions present in each unique situation. The drivers of elevated water temperature are well understood (see sections 2.0-4, 5.1, and 5.2), however the site-specific impacts of those drivers in any specific setting are best evaluated on a case by case basis for each situation.

In the case of nonpoint source land uses, these evaluations are often made on the basis of prescribed operation rules, performance standards, or best management practices (see section 4.4: Reliance on Management Measures for Nonpoint Sources Associated with Land Uses). However, even in these situations some site-specific evaluation is often necessary to evaluate the application of operating rules or management practices to the unique attributes of the setting in question. For instance, some permits involve an on–the-ground assessment of water quality protection and preparation of plans to address specific water quality issues identified in the assessment. An example of this is the Regional Water Board's USFS Waiver (order R1-2010-0029), which allows for the removal of riparian vegetation if it can be demonstrated that the exception will result in a net long-term benefit to water quality and stream temperatures, which must be evaluated against the specific characteristics of the project. The CA Forest Practice Rules have a similar provision for exceptions to canopy retention prescriptions when alternative prescriptions provide equal or more favorable protection than that afforded by the standard prescriptions. In processes such as these, the application of management practices or performance standards is translated to the unique conditions present at the site in question.

In order to evaluate whether water temperatures in a given waterbody represent natural conditions, the natural state of temperature drivers must be assessed. For instance, a riparian area with a history of canopy removal may provide the same level of solar attenuation as another undisturbed riparian area with low levels of canopy due to sub-optimal growing conditions, with resulting temperatures that are nearly identical. In the first case, the site may not be meeting the intrastate water quality objective for temperature because the levels of solar radiation are unnaturally high due to reduced riparian vegetation from past activities resulting in unnaturally elevated water temperatures, whereas the same temperatures in the second stream would meet the objective if the other drivers were also consistent with natural conditions. Similarly, a project that removes riparian vegetation may or may not increase solar radiation loading in the stream depending on the geometry of the vegetation relative to the stream and surrounding topography. Finally, the relative stream temperature condition is another factor that must be considered when evaluating whether a project will cause exceedence of the intrastate water quality objective for temperature. For instance, a stream that is cold relative to air temperatures, such as a spring-fed inland stream near its source, will be much more sensitive to additional heat loads than a stream that is already warm and near the equilibrium temperature (see section 2.2, Interaction of Temperature Drivers). Similarly, a relatively cold stream with reduced flows will be more sensitive to heat loads than a relatively warm stream that is near the equilibrium temperature.

The site-specific approach to implementing the temperature objectives at the project scale also allows for Regional Water Board staff to make determinations that unique circumstances exist that allow exceptions to standard practices employed for the protection of water temperature. For instance, the Regional Water Board has approved restoration projects conducted on the Mendocino Coast that involve the felling of riparian trees into watercourses to add large woody debris to the stream. Large woody debris in stream channels has been identified as a critically important habitat component for Coho salmon that are missing in these streams. These projects occurred in streams that have cold water temperatures, relatively high canopy and shade levels, and cool coastal air temperatures. In these cases, Regional Water Board staff weighs the risk of elevating water temperatures against the benefits of eliminating an important factor limiting the recovery of a listed species.

Another unique example of an instance in which actions resulting in reduced shade were approved by the Regional Water Board is the General Water Quality Certification for the Bureau of Reclamation Trinity River Restoration Program's channel rehabilitation activities downstream of the Trinity River reservoirs (Order No. R1-2010-0028). The primary purpose of the project is to increase salmonid habitat in the mainstem Trinity River and its side channels. Channel rehabilitation activities include removal of encroaching riparian vegetation, rehabilitation of floodplain and in-channel alluvial features, construction of off-channel habitat for aquatic and riparian dependent species, coarse and fine sediment management, and rehabilitation of upland habitat. Channel habitat rehabilitation activities are designed to use the alluvial processes of the Trinity River to maintain and increase salmonid habitat and complexity for all life-stages over time, and to provide conditions suitable for reestablishing and sustaining native riparian vegetation. Collectively, channel rehabilitation activities are intended to meet the overarching goal of the Trinity River Restoration Program (TRRP) to create, restore, and enhance the full range of habitats for native anadromous fishes, including salmon and steelhead. The removal of riparian vegetation associated with the project was deemed necessary to meet the goals of the program because decades of controlled releases from the Trinity River reservoirs had eliminated high flows that prevented the encroachment of riparian vegetation. The resulting riparian encroachment altered the channel morphology in a manner detrimental to beneficial uses.

Other situations in which reductions of shade may be appropriate for water quality protection include: fuels reduction projects in riparian areas composed of dense second growth, thinning projects designed to increase the growth rate of dominant trees and increase shade levels in a shorter time, and other projects in which a short-term reduction of shade occurs while achieving a long-term benefit to beneficial uses.

4.4 Reliance on Management Practices for Nonpoint Sources Associated with Land Uses

The Regional Water Board prefers to regulate discharges of waste and controllable water quality factors associated with nonpoint sources in the context of adaptive management, wherein management measures designed to address a water quality concern are implemented and monitored in a manner that provides for feedback on the performance of the measures and any need for modification of the practice, as appropriate. In the case of temperature, this approach substitutes the use of pre-defined operating rules, performance standards, best management practices, or restrictions on certain activities, for the sometimes difficult and unwieldy process of determining natural conditions and estimating the anticipated temperature changes associated with an activity. This approach is advantageous to the project proponent because it streamlines the evaluation and approval process and provides a level of regulatory certainty. The same process is advantageous for the Regional Water Board because it increases the efficiency of regulatory permitting, allowing staff to focus on on-the-ground water quality issues, by streamlining the evaluation and approval process. This approach also allows for the development of general permits for certain activities, rather than the inefficient process of developing individual permits for similar activities.

Certain nonpoint source activities may also be subject to regulatory or non-regulatory actions of other entities that provide temperature protections. If the Regional Water Board determines that those actions will result in attainment of water quality standards, the Regional Water Board may include those actions as implementation measures in a permit. The Regional Water Board can, and often does, rely on existing non-Water Board programs for permit measures, adding new requirements only as necessary to provide adequate water quality protection. When addressing compliance with the temperature objective, the geographic location, existing regulatory and non-regulatory programs, and other relevant factors should be evaluated in determining appropriate and necessary shade controls.

Compliance with the intrastate water quality objective for temperature as it relates to shade and solar radiation is generally achieved by managing vegetation that provides shade to a waterbody in a manner consistent with site potential effective shade. To accomplish this, responsible parties are encouraged to delineate a separate management area for riparian vegetation that has the potential to shade a waterbody, and manage these riparian areas differently than the surrounding land. These areas are often referred to variously as a riparian management zone, streamside buffer area, or a watercourse and lake protection zone.

When Regional Water Board staff evaluates the shade-related temperature controls provided through riparian management practices, staff evaluate whether the practices employed result in riparian shade conditions consistent with shade conditions representative of riparian vegetation undiminished by human activities. The evaluation is not whether the vegetation conditions are, in fact, unaltered, but rather if the vegetation conditions result in roughly equivalent solar radiation loading at the water surface. For instance, site potential vegetation conditions in a coastal redwood environment may have historically included redwoods trees in excess of 300 feet in height. However, the same solar radiation loading may result from trees half that height or less, due to vegetation overhang, understory vegetation, and riparian hardwood species present. The factors that must be assessed generally relate to the height, depth, and density of vegetation, as well as the geometry of the water surface relative to the sun and any topographic shading provided by mountains and streambanks. Management practices that provide this type of protection are considered consistent with the intrastate water quality objective as it relates to shade and solar radiation.

An example of management practices relied on for the maintenance of shade are the Forest Practice Rules relating to watercourse and lake protection zones for fish-bearing streams in areas where anadromous salmonids are present. These rules result in shade levels consistent with natural conditions through the designation of no-cut zones adjacent to streams and canopy retention zones adjacent to the no-cut zone. Additionally, the rules require retention of the 7 largest trees per acre of the inner and core zones in the interior of the north coast (See Figure 4.2), and the 13 largest tress per acre within the core and inner zones in the coastal anadromous zone. The Forest Practice Rules allow for exceptions to these requirements for projects that "would result in effects to the beneficial functions of the riparian zone equal to or more favorable than those expected to result from the application of the operational provisions required under" the standard watercourse and lake protection rules that apply (CA Forest Practice Rules 2013).

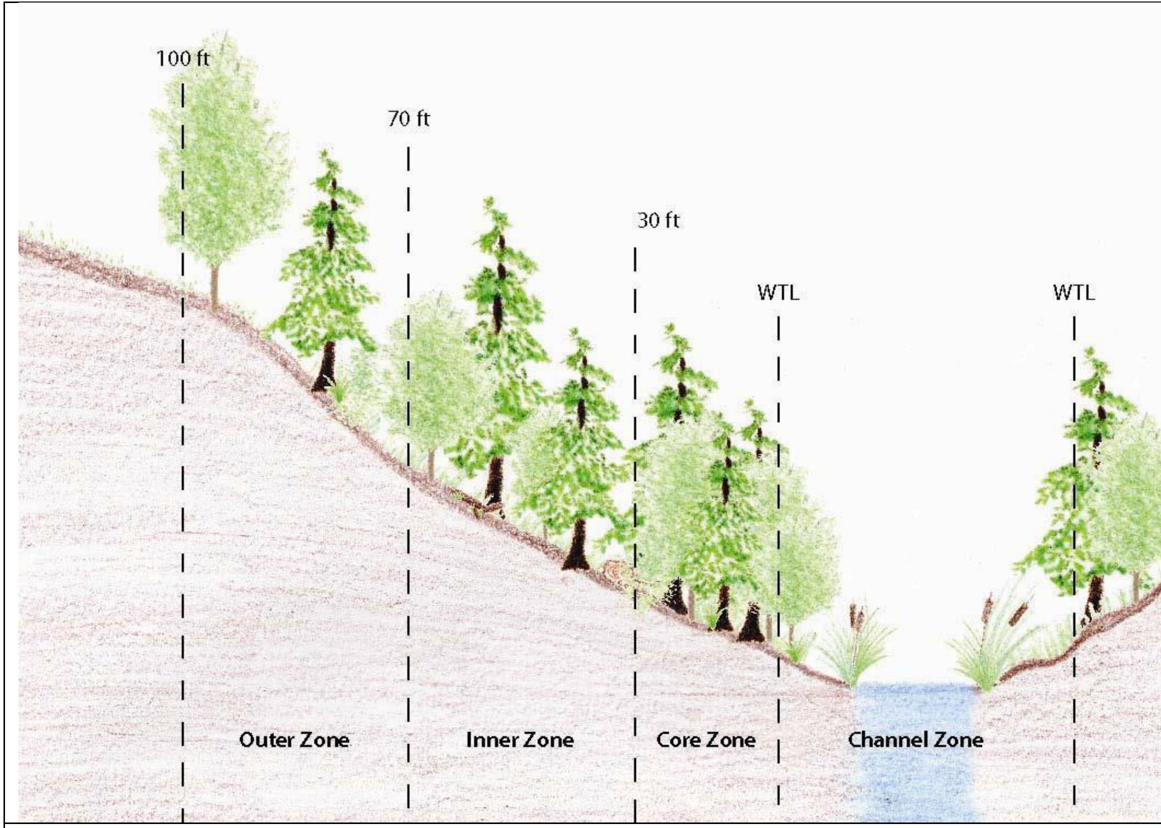

Figure 4.2: Watercourse and lake protection zone for confined fish-bearing streams outside the coastal anadromous zone. In this setting, the core zone must be left un-cut, 70% overstory canopy must be retained in the inner zone, and 50% overstory canopy in the outer zone. Additionally, the 7 largest trees per acre of the core and inner zone must be retained. (CA Forest Practice Rules 2013)

The Forest Practice Rules also establish management practices for the control of sediment discharges. The Regional Water Board relies on the implementation of those management practices, in part, as an element of the sediment control requirements of its timber regulatory program. In addition, many timber companies have adopted additional standard management practices that they implement as a matter of practice, and that are considered during the timber harvest plan review process.

Another example of the reliance on management practices is the incorporation of the USFS best management practices as conditions of the USFS Waiver. This permit, by virtue of its conditions, also implements sediment, temperature, and nutrient TMDLs, and meets the Basin Plan intrastate temperature objective. The USFS Waiver adopts the USFS program that manages and maintains designated riparian zones to ensure retention of adequate vegetative cover that results in natural shade conditions. The USFS program requires retention of trees within 300 feet slope distance on each side of fish-bearing streams, 150 feet slope distance on each side of perennial streams, and 100 feet slope distance on each side of ephemeral/intermittent streams, or the site potential tree height distance on each side of the stream, whichever is greatest. The USFS Waiver provides for exceptions to these requirements if it can be demonstrated that the exception will result in a net long-term benefit to water quality and stream temperatures. Additional best management practices are defined for the control of sediment and nutrient discharges associated with road management, grazing, and other sources of nonpoint source pollution.

Regional Water Board staff sometimes rely on management measures defined at a site-specific level to address specific water quality concerns. An example of this approach is that taken in the Scott and Shasta River TMDL conditional waivers. These waivers rely on the development of site-specific plans, including ranch plans, to define what actions the landowner will take to address identified water quality concerns, including those associated with temperature, sediment, and nutrients. An adaptive management process involving effectiveness monitoring and adaption of practices to achieve water quality goals ensures the approaches achieve water quality protection.

The uncontrolled use of riparian areas by livestock can lead to impacts that elevate water temperatures. However, the use of riparian areas by livestock can be conducted without these temperature impacts. Grazing of riparian areas is not incompatible with water quality goals if conducted in a manner with water quality protection in mind. The intensity, duration, and timing of livestock use are critical considerations that determine whether livestock use is or is not harmful to riparian areas. Livestock management in riparian areas often requires an approach similar to the management practices employed in forestry, wherein a special management zone near the stream is managed differently from the surrounding areas. Practices such as flash grazing, where livestock are allowed to graze in the special management zone until thresholds, such as a minimum stubble height of grass, are met can be conducted without interfering with the natural riparian vegetation processes that provide the shade necessary to achieve temperature objectives. In such cases, a riparian grazing and monitoring plan can be the basis of Regional Water Board staff's evaluation of water quality protection.

4.5 Implementation in Impaired vs Unimpaired Waterbodies

Waterbodies that are not meeting the water quality objectives for temperature are considered impaired, and are identified on the 303(d) list of impaired water bodies as such. Many, but not all waterbodies impaired by elevated water temperatures have had TMDLs developed for them. The development of temperature TMDLs in the North Coast Region is discussed in Section 2.0. When waterbodies are not meeting the temperature objectives, either because their water temperatures have been elevated above a temperature threshold associated with a beneficial use, or because they have temperatures elevated above 5 ^{o}F, no additional temperature increase can be accommodated.

Because temperature impaired waterbodies cannot accommodate any increase in temperatures, the intrastate water quality objective for temperature requires that permitted conditions result in natural conditions in these waterbodies. In the case of shade, natural conditions are defined as site-potential conditions, as discussed in section 3.1, above. Thus, the approach to regulating impaired waterbodies must be consistent, regardless of whether a TMDL has been developed.

The actions necessary to recover a waterbody that is temperature impaired due to alteration of the drivers of water temperature are the same types of actions that prevent a waterbody from becoming temperature impaired by such alterations. For instance, in the case of a stream with elevated temperatures caused by increased solar radiation resulting from vegetation removal, the action necessary to recover the natural temperature regime is to allow the riparian vegetation to grow back (or actively restore the vegetation conditions) such that the natural shade condition is once again achieved. In the case of an unimpaired stream with unaltered temperatures, the riparian management action necessary to prevent the elevation of water temperatures is to prevent increases in solar radiation by maintaining sufficient riparian vegetation. In both cases, the riparian vegetation must be maintained and allowed to persist. The difference is that some amount of increased solar radiation exposure may be allowed in the unimpaired stream if it can be demonstrated to the Regional Water Board's satisfaction that:

- any temperature change won't adversely affect beneficial uses;
- water temperatures are not increased by 5 ^{o}F or more at any time or place; and,
- the Antidegradation Policy is not violated.

The Regional Water Board establishes permit conditions that are expected to result in no alteration of temperature, as explained in section 4.0, above. Accordingly, it is appropriate for the Regional Water Board to establish permit conditions consistent with natural conditions, including site-potential effective shade. Dischargers and project proponents seeking a relaxation of this requirement should submit an analysis that satisfies the requirements described in the paragraph above.

In order to prevent future impairments and address existing temperature impairments, the regulatory approach to managing riparian vegetation for the protection of unimpaired temperatures and the regulatory approach to managing riparian vegetation to correct elevated water temperatures should be consistent throughout the region. Furthermore, the regulatory approach should be based on implementation of both the intrastate water quality objective for temperature and the Antidegradation Policy, as described above.

4.6 Regulation of Shade as a Controllable Factor

The Regional Water Boards regulate the thermal impacts associated with increased solar radiation loads and the shade provided by riparian vegetation in the context of other types of discharges. The Porter-Cologne Water Quality Control Act (Act) authorizes the State and Regional Water Boards to control the discharges of waste to waters of the state through issuance of permits and by prohibiting certain activities. Solar radiation loads are not a discharge of waste, as defined by the Act. However, the Act states in Section 13263, Requirements for Discharge:

> "The regional water board, after any necessary hearing, shall prescribe requirements as to the nature of any proposed discharge, existing discharge, or material change in existing discharge…with relation to the conditions existing in the disposal area or receiving waters upon, or into which, the discharge is made or proposed. <u>The requirements shall implement any relevant water quality control plans that have been adopted, and shall take into consideration the beneficial uses to be protected, the water quality objectives reasonably required for that purpose, other waste discharges, the need to prevent nuisance</u>, and the provisions of Section 13241[2]." (emphasis added.)

The act defines "water quality control" as follows:

> "Water quality control" means the regulation of any activity or factor which may affect the quality of the waters of the state and includes the prevention and correction of water pollution and nuisance. [Section 13050(i)]

The Basin Plan is a water quality control plan. Thus, the Act authorizes the Regional Water Board to "prescribe requirements", including requirements related to "any activity or factor which may affect the quality of the waters of the state", that implement the Basin Plan and its programs of implementation. Controllable water quality factors are explicitly addressed in the Basin Plan. The Basin Plan states on page 3-1.00:

> "Controllable water quality factors shall conform to the water quality objectives contained herein. When other factors result in the degradation of water quality beyond the levels or limits established herein as water quality objectives, then controllable factors shall not cause further degradation of water quality. Controllable water quality factors are those actions, conditions, or circumstances resulting from man's activities that may influence the quality of the waters of the State and that may be reasonably controlled."

The Porter-Cologne Act establishes the authority of Regional Water Boards to adopt waste discharge requirements and prohibitions to control the discharge of waste to waters of the State in order to achieve water quality objectives that support beneficial uses, as defined in the Basin Plan. This proposed amendment to the Basin Plan clarifies that the alteration of shade caused by human activities is a controllable water quality factor that must be addressed, as appropriate, in waste discharge requirements issued by the Regional Water Board, and regulatory actions by other

[2] Section 13241 pertains to the establishment of water quality objectives.

state agencies. This is not a new interpretation, nor is it a change in Regional Water Board practice. However, identifying shade as a controllable water quality factor in the Basin Plan makes clear the importance of addressing shade to other agencies, dischargers, and other interested parties.